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Predicting students' academic performance based on school and socio-demographic characteristics

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Students' trajectories into university are often uniquely dependent on school qualifications though these alone are limited as predictors of academic potential. This study endorses this, examining associations between school grades, school type, school performance, socio-economic deprivation, neighbourhood participation, sex and academic achievement at a British university. Consistent with past research, large entry-level differences between students are generally narrowed by final year at university. Students from the most deprived areas performed less well than more affluent students. Asian and black students performed less well than white students. Female students performed better than their male counterparts. Contrasting with past research, though school performance was positively associated with entry grades, students from low-performing schools were more likely to achieve the highest degree classifications. Additionally, independent school students performed less well than comprehensive school students at final year despite entering with higher grades. These variations exemplify how patterns observed nationally may differ between universities.

Keywords: education; attainment; contextual background; inequality

Despite a dramatic increase in higher education (HE) participation in England over the last half century, the under-representation of students from socio-economically disadvantaged backgrounds remains a glaring reality (Blanden and Machin 2004; Breen and Jonsson 2005; Croxford and Raffe 2013; Haveman and Smeeding 2006; Singleton 2010a). These students are known as Widening Participation (WP) students, who along with students with disabilities and some ethnic minority groups are currently under-represented in HE (Gorard 2008; Mason and Sparkes 2002). Differences in HE participation are largely attributed to the poorer school-level academic qualifications obtained by a large proportion of students within low socio-economic status (SES) classifications and are associated with educational disadvantage (Chowdry et al. 2013; Steele, Vignoles, and Jenkins 2007; Sutton Trust 2005). Further, research comparing the academic performance of students from different school types and

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backgrounds in HE suggests that school qualifications do not necessarily represent 'true academic potential' (Hoare and Johnston 2010; Ogg, Zimdars, and Heath 2009; Peers and Johnston 1994; Zimdars 2007). In particular, the finding that students from independent schools tend to enter university with higher grades than students from (non-fee paying) state schools but perform less well once at university when entry grades are held constant is regarded as rationale for utilising contextual data alongside school grades in the university admissions process (HEFCE 2003, 2014; Hoare and Johnston 2010; Naylor and Smith 2005, Sutton Trust 2010a).

Contextual data places academic attainment into the context of the circumstances in which the results were obtained, including comparative school and socio-economic data, with the principal aim of promoting fair access to HE (Bridger, Shaw, and Moore 2012). The implementation of this alongside school grades is often recommended on the grounds that currently university admissions systems in the UK focus almost entirely on students' past academic results, often without giving any consideration to the context in which these were achieved (Chowdry et al. 2013; Gorard 2008; HEFCE 2014; Mullen 2011; Sutton Trust 2010b).

Though the usage of contextual data in admission has been historically controversial, associated with positive discrimination and social engineering (Henry 2013), it has progressively become more acceptable and is now being actively encouraged provided that institutional policy is transparent and based on evidence (Department for Business, Innovation & Skills 2011). A survey looking at the use of contextual data in admissions carried out by SPA in 2012 found that out of 17 higher education institutions (HEIs) approximately one-third (37%) were using contextual data in admissions and 57% were planning to use it (Moore, Mountford-Zimdars, and Wiggans 2013). Though the type of contextual information used varies widely between institutions, this generally includes information relating to students' personal details, school and college data, and area-level data (Bridger, Shaw, and Moore 2012; Moore, Mountford-Zimdars, and Wiggans 2013). However, research examining this and relationships between contextual background characteristics and achievement in general is highly limited (Gorard 2008; Moore, Mountford-Zimdars, and Wiggans 2013; Zimdars 2007). Addressing these issues is critical as it could help mitigate inequalities persistent in UK HE participation (Sutton Trust 2005). The extent of such inequalities is reflected empirically with more than two-fifths of students studying at Oxbridge Universities being privately educated, despite the fact that just 7% of schools in the UK are independent (Sutton Trust 2008).

Greater degrees of socio-economic inequality and social stratification have been associated with pervasive negative educational, health and crime-related outcomes (Feinstein 2003; Cabinet Office 2011; Wilkinson and Pickett 2009). Promoting fair access to HE is considered imperative as a means to reducing these inequalities and associated detrimental repercussions (Haveman and Smeeding 2006; Kelly 2012). Concomitantly, increasing equality of opportunity is important for raising skill levels, contributing to national productivity and social mobility (Dorling 2010). These are considered priority issues in the UK where currently the usage of contextual data as part of the university admissions process is promoted as part of a broader widening participation policy agenda (Cable and Willets 2011, Croxford and Raffe 2013; Milburn 2009). This is specifically promoted within government reports proposing 'HEIs should continue to use, and where possible, expand the range of all the information available to them to identify the best students with the greatest potential to reach the highest academic achievement' (Department for Children, Schools and Families 2008, 12).

The ever-increasing pressure to widen access to prospective students from socio-economically deprived groups has been greatly augmented by a substantial increase in tuition fees from £3600 to a maximum of £9000 per annum (Cable and Willets 2011; Harrison 2011). Consequentially, identifying and targeting people from socio-economically disadvantaged areas with academic potential has become of even greater financial importance to HEIs, as potential to charge the full uncapped amount is only permissible if the Office for Fair Access (OFFA) considers that programmes are being made available to everyone with academic potential (Browne 2010; Clayton 2012). Moreover, the usage of contextual data in the admissions process could help widen participation and identify students who may require academic support (Henry 2013). However, justifying the implementation of contextual data in university admissions necessitates a robust evidence base, which can adequately demonstrate the impact of students' background characteristics on academic performance (Bridger, Shaw, and Moore 2012). This paper seeks to expand this evidence base by examining relationships between a selected range of school and socio-demographic factors identified as predictors of educational disadvantage and academic performance at a British university.

Contextual background characteristics

The literature identifies a range of background characteristics that influence educational disadvantage and differentiated performance including school effects, socio-economic background and personal attributes.

In comparison to students from more affluent backgrounds, a disproportionate number of students from socio-economically disadvantaged backgrounds attend poor-performing schools and come from neighbourhoods with low participation in HE (HEFCE, 2010), and this can impact on their chances of entering HE (Forsyth and Furlong 2003; Gorard 2012; Leathwood 2004; Voigt 2007). Although there is an overlap between school type and school performance, where fee-paying schools are predominantly higher performing, the associations between school type and school performance with academic performance at university has been found to differ between studies (HEFCE 2003, 2005, 2014; Smith and Naylor 2001). Indeed, the average performance of students at a school does not appear to have a consistent effect on academic attainment in HE (Ogg, Zimdars, and Heath 2009). There is disagreement regarding the direction of the effect of school performance on academic attainment (HEFCE 2003; Smith and Naylor 2001) including whether or not school performance has a significant effect at all (HEFCE 2014; Hoare and Johnson 2010).

Furthermore, even though fee-paying schools tend to have better overall performance, a 'school type effect' has been documented whereby for a given set of A-level results, the degree performance of students who attended state schools has been found to be higher, compared to those who attend private schools, when all other factors are held equal (HEFCE 2003, 2005, 2014; Hoare and Johnston 2010; Naylor and Smith 2005; Sutton Trust 2010b). This 'school type effect' has been evidenced in numerous studies, where it is considered to make a 'strong case' for making lower offers to individuals from disadvantaged backgrounds as on average their performance at HE would at least match that of an independent school student (HEFCE 2003, 2005; Henry 2013; Kirkup et al. 2010; Naylor and Smith 2005; Smith and Naylor 2001). The justification is based largely on the assumption that independent school pupils are at an advantage over students from state schools with a similar level of ability, who may be in

an environment that prevents them from achieving grades reflective of their true academic potential (McNabb, Pal, and Sloane 2002). School type differences in HE achievement appear to be less marked between students with the highest A-level achievement and HEIs with highest entry requirements. This has led researchers to question whether the 'school type effect' exists at these institutions in the past (HEFCE 2003, 2014; Parkes 2011).

A further variable that is associated with disadvantage and individual performance is socio-economic background. This attribute also often interacts with school effects given patterns of social selection associated with school admissions policy (Singleton et al. 2011). Various studies have found that students from the least affluent socio-economic groups tend to perform less well than their more affluent peers (HEFCE 2014; Hoare and Johnston 2010; Smith and Naylor 2001). However, much of the research examining these socio-economic differences in HE attainment has used the National Statistics Socio-Economic Classification (NS-SEC), the method currently used to identify SES during the university admissions process (Harrison 2011; Harrison and Hatt 2009; Hoare and Johnston 2010; Singleton 2010b). However, a number of flaws have been identified with the use of NS-SEC as a contextual background characteristic, particularly as around 25% of students do not provide this self-identified non-mandatory information on application to HE, and those who omit this, often fit into target WP populations (Harrison and Hatt 2009, 2010; Singleton 2010b).

An alternative approach to NS-SEC utilises postcodes, linking individuals to a domicile location by geo-coding home postcode. However, in presenting such analysis, this is accompanied by an important caveat that the measure relates to the context of an area in which a student lived, rather than an attribute they personally possess (Gorard 2012; Osborne and Shuttleworth 2004). That said, for the majority of undergraduate admissions, NS-SEC is also not an individual measure, as this relates to parental occupation, although geographic context could perhaps be considered applicable at a household scale.

By attaching locations to the domicile postcodes of students, these can be linked to a range of indicators of locational context, each of which pertains to a spatial unit of a given zonal size. Such indicators include the Index of Multiple Deprivation (IMD), which is a well-recognised measure of deprivation, comprising data pertaining to seven different dimensions (Income, Employment, Health and Disability, Education, Skills and Training, Barriers to Housing and Services, Living Environment and Crime) (Flouri, Mavroveli, and Midouhas 2013). IMD scores are derived at the scale of Lower Layer Super Output Areas (LSOAs), which are areas containing between 400 and 1200 households. The IMD has, however, received surprisingly little attention in educational research compared to other fields, despite being recommended by the HEFCE (2007) as a means of identifying people from NS-SEC groups 4–7 (Broecke and Nicholls 2007; Feinstein 2003; Harrison 2011; Lupton 2004).

A further measure that has received relatively little attention in educational research, despite it being devised by HEFCE to identify those from backgrounds with lower levels of participation in HE, is the Participation Of Local Areas classification (POLAR 3) (Corver 2010). POLAR 3 was created by HEFCE, by ranking 2001 Census Area Statistic (CAS) Wards by their young participation rates for the combined 2005–2009 cohorts. There are a total of 8850 CAS wards in England and Wales with an average population of just under 6000 (Finney and Jivraj 2013). The POLAR 3 classification reports the rates of participation for those wards and is typically divided into quintiles. There are also limited examples of research using the POLAR classification,

which is particularly surprising considering this is used by HEFCE for calculating widening participation funding, and by the Higher Education Statistics Agency (HESA) to measure institutional performance (HEFCE 2012, 2014). However, recently HEFCE (2014) used both POLAR 3 and the Indices of Deprivation Affecting Children as postcode-based measures of disadvantage and found that students from neighbourhoods with lower levels of participation in HE and students from less affluent areas, respectively, were consistently less likely to achieve a 2:1 or a first-class degree at university.

Finally, personal characteristics such as sex and ethnicity are also known to influence academic performance (Ackerman, Kanfer, and Beier 2013). Research suggests that on average females generally achieve higher grades than males throughout education, with some studies reporting that males may be more likely to achieve a first-class degree (Dayioğlu and Türüt-Aşik 2007; Gneezy, Niederle, and Rustichini 2003; Hu and Wolniak 2013; McCrum 1994, 1996; McNabb, Pal, and Sloane 2002; Mellanby, Martin, and O'Doherty 2000; Pomerantz, Altermatt, and Saxon 2002; Sheard 2009). Though the present study does not focus on ethnicity, significant differences in performance and participation have been documented between ethnic groups. In the UK, white students as an overall category have been found to perform slightly better than students who were not self-identified as white (Broecke and Nicholls 2007; HEFCE 2014; Jacobs 2008; Richardson 2008).

Previous studies have examined associations between students' background characteristics and academic performance nationally and at individual universities (HEFCE 2003, 2005, 2014; Henry 2013; Smith and Naylor 2001). However, no previous case studies have been found which use both postcode-based measures of disadvantage along with school background information to identify educational disadvantage despite the limitations associated with measures such as NS-SEC and known differences in student composition existent between HEIs (Gibbons and Vignoles 2012; Reay, Crozier, and Clayton 2010; Reay et al. 2001; Singleton 2010a, 2010b). This is critical from an admissions perspective as it is the responsibility of individual HEIs to ensure that their fair admissions policies are grounded in empirical evidence and it is in their interests to target those students with the academic potential to perform well in their studies. The present study at a British university endorses this by investigating the extent to which students' contextual background characteristics influence academic/degree performance.

Method

Measuring and modelling contextual background and achievement

This study examines data from a British university, one of the six original 'red brick' civic universities and a founding member of the Russell Group. Traditionally, such elite universities in the UK have tended to have an over-representation of students from more affluent backgrounds and are more selective, with higher entry requirements (Sutton Trust 2010b). However, the fact that the university campus is based in a city with some of the most socio-economically deprived areas in the country means that traditionally the university has attracted a relatively high proportion of applicants from low SES backgrounds.

Table A1 shows how the University of Liverpool (UoL) compares in the recruitment of under-represented groups both nationally and in relation to other Russell

Group universities. Compared to other Russell Group universities, the UoL has a higher intake of students from low participation neighbourhoods (LPN) (POLAR 3), students from lower socio-economic groups (NS-SEC 4–7) and students from low-income households. Despite this, compared to national averages, the intake of students from disadvantaged backgrounds at the UoL is generally lower. However, the proportion of students from state schools at the UoL is similar to the national average, in this way in particular the UoL differs from other Russell Group universities.

Data for the study were obtained from the university central student database, which includes all necessary student background information and tracks performance from the point of application through to graduation. For the purposes of this study, only students registered on full-time three-year classified degrees entering the university between 2004/2005 and 2009/2010, and then graduating three years after their entry were included. This was the last entry year that allowed analysis of both entry and exit points. There were no significant changes to the university's admission policies or grading criteria during this time period, so data were stratified by year of entry but also treated as a single data set. The data set contains socio-demographic (sex, age, ethnicity and domicile), school attended, prior attainment (based on Universities and Colleges Admissions Service [UCAS] Tariff Points), and HE performance information for 5369 students.

Where data were missing for key variables, students were excluded from the analysis. This was primarily socio-economic information as not all postcodes could be matched to IMD and POLAR 3 scores, though a small proportion of academic information was also missing. Analyses were designed to explore research questions centred on the relationships between school type, school performance, socio-economic background and academic performance at university. The full list of variables included in the analysis is described in Table A2 (see Appendix).

In order to make comparisons between degree programmes and students as fair as possible, students registered on four- and five-year programmes including Veterinary Science, Medicine and Dentistry were excluded from the data set. Secondly, only students with a postcode within England were included in the analyses as the IMD is produced separately in each of the four UK administrations. Students from outside the UK were also excluded. Finally, only data for students who completed three-year degrees programmes successfully were included in this study.

Univariable logistic regression was carried out summarising the association between contextual background characteristics and academic performance; this was defined as good (2:1, first classification) versus other. Multivariable logistic regression was carried out to identify which factors were independently associated with academic performance. All analyses were undertaken using SPSS (version 21).

Results

There was no evidence of collinearity between the explanatory factors used in the analysis ($p > .05$).

Students in the data set were predominantly self-classified as white (91.5%) and aged below 21 (92.4%). The percentage of males and females in the study was relatively uniform (58.4% females) in aggregate, though differences in the proportion of males and females across university faculties varied.

Table A3 presents a descriptive summary of the association between each of the contextual background characteristics and academic performance. Significant

differences were observed in the Universities and Colleges Admissions Service (UCAS) tariff points of students from different school backgrounds, quintiles of socio-economic deprivation, neighbourhoods with different levels of participation in HE, different ethnicities and between males and females.

The majority of students came from comprehensive schools and sixth form colleges (3431, 75.2%). Students who attended grammar schools and sixth form colleges came into university with the highest UCAS tariff points (Table A2). However, similar findings were not reflected in university attainment, as students from comprehensive schools achieved the highest average final year grades, and generally performed better than students from all other school types. Conversely, students from independent schools and students from the category of schools 'state other' achieved the lowest average grades at university compared to students from other school types. Moreover, these students were also significantly more likely to achieve degree classifications below a 2:1.

Students who attended schools that were considered high performing in terms of A-level performance/equivalent entered university with higher A-level (or equivalent) grades compared to those who went to lower performing schools ($p < .0005$). However, by final year at university, differences in overall mark averages were no longer statistically significant. A similar pattern was observed when comparing the academic performance of students with different levels of neighbourhood participation in HE (POLAR 3). Here, students from high participation neighbourhoods (HPN) entered university with significantly higher UCAS tariff points than students from LPN; however, by the final year at university, differences between students from LPN and HPN were no longer statistically significant.

With respect to multiple deprivation (IMD), the number of students within each quintile increased as deprivation decreased, so there were 2.17 times more students in quintile 5 (least deprived) than quintile 1 (most deprived). There was also a positive relationship between IMD quintile and UCAS tariff points such that students from the least deprived areas entered university with the highest UCAS tariff points and conversely, students from the most deprived areas entered with the lowest UCAS tariff points. By contrast, material deprivation predicted only slight differences in academic achievement once students were at university. Indeed, only students from the most deprived socio-economic quintile achieved slightly less well on average and were more likely to achieve lower second class or a lower degree classification, but this was not statistically significant.

With regard to ethnicity, there were significant group differences in students' UCAS tariff points, which decreased but were largely consistent at university. Black students entered university with the lowest number of UCAS tariff points and once at university achieved the second lowest average attainment after Asian students. Students from both of these ethnic groups were also more likely to get a degree of 2:2 or lower.

Finally, a consistent statistically significant association was observed for sex in relation to academic attainment in both school and university attainment. Males entered university with significantly lower grades than females, achieved lower average marks at university and were also less likely to get a 'good degree' (2:1 or above).

Table A4 summarises the results for contextual background factors in relation to final degree classification. Compared to students from the most deprived quintile (IMD), students from all of the other IMD quintiles were slightly more likely to obtain a good degree; however, this association was only statistically significant for IMD quintiles 4 and 5. Secondly, compared to students who had attended comprehensive schools, students from the four other types of school were less likely to obtain a good degree, but

this association was only statistically significant for students from independent schools. Thirdly, ethnicity was significantly associated with degree performance, where compared to white students, Asian and black students were more than 50% less likely to achieve a good degree. Finally, sex and UCAS tariff points were both found to predict significant differences in the probability of getting a good degree.

There were no significant differences in the likelihood of achieving a good degree at university between groups of students who came from neighbourhoods with low/high participation and between those students who attended schools with low/high levels of performance (Table A4).

Multivariable logistic regression was carried out to estimate how students' background characteristics including neighbourhood participation (POLAR 3), deprivation, educational background and personal characteristics influenced their odds of getting a good degree. Table A5 presents these results incorporating the seven background characteristics simultaneously and degree performance as a binary outcome (1st and 2:1 versus all others).

Whilst the majority of associations between socio-economic deprivation and educational performance were initially found to be statistically significant in the univariable analysis, in multivariable analysis socio-economic deprivation was observed to exert less of an influence on the chances of getting a good degree after allowing for the effects of the other variables (Table A4). Compared to students from the most deprived socio-economic quintile (quintile 1), students from quintile group 4 were most likely to achieve a good degree (odds ratio (OR) = 1.34; 95% CI = 0.99–1.82); comparisons with other quintiles did not achieve statistical significance.

Compared to comprehensive school students, multivariable analyses revealed that students from all other types of school had significantly lower odds of achieving a good degree (with the exception of the category 'state other' where the association was not statistically significant) (OR = 0.58; 95% CI = 0.27–1.24). The difference was greatest between students from comprehensive schools and students from independent schools who were found to be 40% less likely to achieve a good degree (OR = 0.61; 95% CI = 0.48–0.77).

Though performance of school did not significantly predict differences in educational performance univariately, there was a significant association in the multivariable analysis. Here it was found that students from schools that were high performing were significantly less likely to achieve a good degree than those from low-performing schools (OR = 0.78; 95% CI = 0.62–0.98). Associations between neighbourhood participation (POLAR 3) and degree classification remained non-significant.

Ethnicity remained a significant predictor of degree performance in the multivariable analysis. Compared to white students, Asian students were 48% less likely to achieve a 'good degree' (OR = 0.52, CI = 0.33–0.82) and similarly black students were 53% less likely to achieve a good degree (OR = 0.47, CI = 0.24–0.89)

Students' sex also remained a significant predictor in multivariable analysis. Compared to males, females were more than 50% more likely to achieve a good degree (OR = 1.52; 95% CI = 1.30–1.79). Finally, students' UCAS tariff points (entry-level performance) were also significantly associated with university performance in the multivariable analysis (OR = 1.01; 95% CI = 1.01–1.01).

Discussion

The principal aim of this research was to explore the relationship between students' contextual background characteristics and academic performance at university in order to

identify which characteristics were associated with students' chances of achieving a 'good degree' (upper second- or first-class degree). No other case studies have been found where this is explored using both postcode-based measures of disadvantage and school background information. Hence, a critical part of this research involved investigating whether patterns identified in previous studies were also evidenced at this British university and exploring potential variations which could exist as a consequence of the differences in student intake and performance which are known to exist even between elite universities (Hoare and Johnston 2010; Singleton 2010b).

Principal findings from results

A crucial part of the analysis involved addressing the extent to which school grades are representative of 'true academic' potential by comparing group differences in attainment at school compared to university. Statistically significant associations were observed between all of the contextual background characteristics: IMD, school type, school performance, neighbourhood participation, sex and ethnicity and students' school grades (UCAS tariff points). With the exception of IMD and POLAR 3, all of these variables were also significantly associated with university attainment, though compared to differences observed in entry grades, these associations differed substantially in terms of size/direction. Additionally, consistent with other studies, school grades were also found to be a strong and significant predictor of academic performance at university (HEFCE 2012, 2014; Kirkup et al. 2010; McKenzie and Schweitzer 2001).

Socio-economic differences persisted in final year performance at university, but only approached statistical significance between students from the most deprived areas and those from the second least deprived group *ceteris paribus*. Additionally, students from the most deprived areas were found to be more likely to achieve degree classifications of 2:2 or below. Unlike the IMD, POLAR 3, hence coming from neighbourhoods with low or high levels of participation in HE, did not predict significant differences in final year performance.

Conversely, the type of school that students attended had a significant and differential impact on school achievement compared to university achievement. Overall, students from comprehensive schools were more likely to achieve a good degree than students from all other school types. Students from independent schools were found to be less likely to achieve a 'good degree' compared to students from comprehensive schools despite being more likely to enter university with higher grades. To an extent, this is similar to the relationship between school performance and academic achievement as students from low-performing schools achieved slightly higher final averages than their counterparts from high-performing schools.

With regard to ethnicity, there were significant differences in students' UCAS tariff points and similar differences were observed in university attainment where Asian students and black students were significantly less likely to achieve good degrees compared to white students. Finally, one variable that did not follow any of the patterns evidenced hitherto was sex. Males entered university with lower grades than females, and once at university were also less likely to achieve either a first or an overall good degree.

How do these findings relate to the current evidence base/other studies?

Differences in academic achievement by SES have been reported in numerous studies (Delaney, Harmon, and Redmond 2011; Hoare and Johnston 2010). These are typically

evidenced from a young age and span across a number of subjects (Aikens and Barbarin 2008; Chowdry et al. 2013; Coley 2002; Evans 2008). Consequently, the differences in academic performance observed in this study are not surprising, particularly as differences that persisted by the third year at university were primarily between students who came from the most deprived areas and students from some of the most affluent areas. Similar findings have been reported in past research and attributed to differences in a range of factors including family support, family history in HE (Allardice and Blicharski 2000; HEFCE 2014; Richardson, Abraham, and Bond 2012), term time working (Moreau and Leathwood 2006; Salamonson et al. 2012), and differences in expectations and aspirations (Pampaka, Williams, and Hutcheson 2012; Thomas 2001).

In this research, the gap in academic attainment between students from neighbourhoods with low or high levels of participation in HE (POLAR 3) was only significant at entry level. Though slight differences prevailed even by final year at university, these were not significant. HEFCE (2014) found little variation in academic performance when POLAR quintiles were examined together and entry grades were taken into account. However, they also found that in particular students from the areas with lowest participation rates (POLAR quintile 1) performed significantly less well and achieved the lowest proportions of high degree classifications.

Ethnic differences in achievement are widespread and have been reported in numerous studies (Broecke and Nicholls 2007; Hoare and Johnston 2010; Woolf, Potts, and McManus 2011). Though variations exist with regard to the particular ethnic groups that perform less well, overall, white students have generally been found to perform better than students from other ethnic minorities (HEFCE 2014; Jacobs 2008; Richardson 2008). The latter was not evidence in this study at entry level or in university attainment. However, compared to white students, black and Asian students were particularly less likely to achieve a good degree, and the proportion of black and Asian students achieving degree classifications of 2:2 or below was alarmingly high. Ethnic differences in achievement such as these are not atypical; these have been identified in other studies and require further exploration.

Though previous studies have reported males as being up to 50% more likely to achieve first-class degrees than females (McCrum 1996; Mellanby, Martin, and O'Doherty 2000), in more recent studies females have been found to outperform males, consistent with the findings from this study (Dayioğlu and Türüt-Aşik 2007; Sheard 2009). The gap in academic performance between males and females is alarming and though this does not relate to WP *per se* requires further exploration, particularly, as differences in subject choice between males and females are acknowledged and studies have found that trends may vary by age, between subjects and have differential effects on employability outcomes (Ackerman, Kanfer, and Beier 2013; Hu and Wolniak 2013; Richardson and Woodley 2003). Consequently, future research should explore interactions between sex, subject choice, SES and outcomes.

The findings pertaining to the relationship between school performance and academic achievement are difficult to reconcile unreservedly with past research, as it is not only highly limited, but findings have been mixed and largely inconsistent (HEFCE 2003; Hoare and Johnston 2010; Smith and Naylor 2001). According to HEFCE (2003), findings have been particularly mixed because the effect of school performance varies largely, depending on factors such as A-level points, students' sex and subject. The findings of this research are consistent with those of Smith and Naylor (2001) who also found evidence of a positive association between attendance at lower performing schools and degree performance. They argue that when comparing

two students with the same A levels, the student who is less advantaged, coming from a state school with lower overall performance, is more likely to have greater underlying ability. This suggests that the school qualifications achieved by students from low-performing schools may not represent their true/academic potential. However, these results contrast with the findings of HEFCE (2003) regarding the direction of the association between school performance and degree attainment and other studies where no significant association was found (HEFCE 2014; Hoare and Johnston 2010). This highlights the need for further research exploring variations in school performance.

Students from independent schools did not enter the university with the highest grades, as was the case in other studies (HEFCE, 2003, 2005, 2014; Hoare and Johnston 2010; Naylor and Smith 2005; Smith and Naylor 2001). However, consistent with past research, once at university, students from independent schools achieved lower results than students from all but one of the other school types, including comprehensive school students (Hoare and Johnston 2010). This effect is said to occur largely because independent school students are at an advantage over students from state schools and this advantage is reflected in their qualifications and progression to HE (Dorling 2010). This advantage is associated with factors including the quality of education students receive, types of subjects offered, a greater focus on preparing students for university and indeed altogether better resourcing as educational spending (23%) on privately educated children in Britain is more than almost any other rich nation in Europe (Hoare and Johnston 2010). According to Ogg, Zimdars, and Heath (2009), teaching effects at independent schools inflate the qualifications obtained by their students. Either or both of these arguments could explain why comprehensive school students enter university with lower results than independent school students but all other factors held equal, finalise with higher results.

Implications of these findings

Results from the present study support the notion that variables such as school grades are not the only causal factors behind patterns in academic attainment in HE and should be accompanied by information that puts this attainment into context. This is evidenced by the fact that even though all of the variables, namely IMD, school type, school performance, neighbourhood participation, sex and ethnicity, were significantly associated with entry grades (UCAS tariff points), overall, differences between groups largely decreased at university. Additionally, associations between school performance and school type differed at university compared to entry level. Specifically, students from low-performing schools and independent schools were less likely to achieve a 'good degree' compared to students from comprehensive and high-performing schools, despite entering university with higher grades. Hence, together, these results support the implementation of contextual information in university admissions. This is widely advocated in educational policy by the government and different HEIs where similar findings have been documented and considered to make a 'strong case' for making reduced offers to students from particularly disadvantaged backgrounds (HEFCE 2014; Henry 2013; Hoare and Johnston 2010; Kirkup et al. 2010; Naylor and Smith 2005; Smith and Naylor 2001; Sutton Trust 2010b).

Despite the increased interest in 'contextualised admissions', there is little publicly available research detailing why and how particular background characteristics are used at individual HEIs (Moore, Mountford-Zimdars, and Wiggans 2013). Additionally, critics argue that making reduced offers to students from socio-economically/

educationally disadvantaged backgrounds discriminates against students from affluent backgrounds/independent schools and may reduce academic excellence at HEIs (Singleton, 2010b). The findings of the present study represent a powerful riposte to such arguments, providing additional support for the 'school type effect' and the notion that school grades may not reflect true academic potential.

Limitations and directions for future research

The present research has various limitations that must be taken into consideration when interpreting these findings. Firstly, it is not possible to control for all factors that affect university attainment. Some prominent factors that were not controlled for include working during term time (Moreau and Leathwood 2006), living at home (Holdsworth 2006), student engagement (Hu and Wolniak 2013; Johnson and Reynolds 2013), family history in HE (Allardice and Blicharski 2000; Delaney, Harmon, and Redmond 2011) and individual characteristics including intelligence (Farsides and Woodfield, 2003; Haworth et al. 2011; Mega, Ronconi, and De Beni 2014). Furthermore, a main limitation of this study is that it did not include students that entered university via non-standard routes, even though research suggests that these students may be more likely to have suffered from educational disadvantage (Broecke and Nicholls 2007; Gorard 2012). Secondly, this study included only those students who successfully completed their degrees; and not those who failed or dropped out; future research should examine trends in academic achievement in these groups of students. Hence, it is important to take into account that these findings are not representative of all university applicants. Another limitation of this research is that the IMD relates only to LSOAs and not postcodes or smaller geographical units (Gorard and See 2009; Hoare and Johnston 2010; Smith and Naylor 2001). Indeed, Gorard (2012) highlights that some of the most deprived families actually live in heavily polarised areas, such as inner London boroughs. Despite this, the IMD was found to be a useful tool for identifying significant differences in performance. Similarly, POLAR 3 is also restricted in this sense as it is also based on aggregate data. Thus, it must be considered that trends relating to both IMD and POLAR 3 do not necessarily relate to individuals themselves but rather to the areas in which they are based. A final and common limitation relevant to the present study lies in the high proportion of missing data as this could significantly bias analyses and results, and is something that must be taken into account (Gorard 2008, 2012).

The need for further research exploring educational disadvantage and variations in academic performance is indisputable, as a number of questions remain unanswered. This is partly due to the strict exclusion criteria that were used to make comparisons between students as fair as possible. Future studies should also focus on those students who entered university via non-standard routes and compare performance of students with different types of school qualifications as trajectories throughout HE may be influenced by these factors. Secondly, it is critical for future research to explore why differences in achievement at university occur in order to support students and identify those at risk of dropping out, failing and/or not achieving a 'good degree'. Thirdly, associations between contextual background and academic performance in programmes extending beyond three years including medicine, dentistry and veterinary science require further exploration. Addressing the paucity of research on this is essential as these programmes are highly oversubscribed, selective and competitive, having higher entry requirements than most other programmes. Finally, it is important to

note that even within elite universities, there are major differences in student composition and student performance. Consequently, though the present case study illustrates important differences between different groups of students at a British university, analyses must be expanded to include other universities. In particular, analysis should focus on the most competitive and selective universities, known as elite universities as these are often criticised for having comparatively less WP students to other universities (Singleton 2010b). The lack of research on this is problematic and must be addressed as convincing evidence is necessary for guiding the decision-making process in the implementation of contextual data alongside school qualifications.

Concluding comments

Understanding factors which are associated with differences in HE participation and performance is crucial, particularly given the expansion that the British HE system has undergone in the last decade, changing financial regimes, and the inequalities which persist (Breen and Jonsson 2005; Sutton Trust 2010b). Though there is general awareness that prior opportunities and social background impact on academic performance and subsequently access to HE, utilising contextual data for admissions in an evidence-based manner is less well understood (Bridger, Shaw, and Moore 2012; Zimdars 2007). This may represent one of the underlying reasons why current contextual considerations are so limited (Zimdars 2007).

However, the usage of contextual information in admissions can be regarded as a mechanism for ameliorating the current admissions systems by addressing limitations related to the usage of examination marks as these alone are not considered an appropriate proxy of an applicant's true academic potential (Ogg, Zimdars, and Heath 2009). The present study provides insight into the associations between different background characteristics and academic outcomes, contributing to the evidence base that advocates the implementation of contextual data alongside school grades during the admissions process. This illustrates how contextual data can be utilised to identify students with school qualifications that may not reflect the extent of their academic potential, but also to help identify those at risk of underperforming once they are in HE (Bridger, Shaw, and Moore 2012; Lupton 2004; Ogg, Zimdars, and Heath 2009). Thus, going beyond purely theoretical analysis, the practical repercussions of the present research could help raise academic attainment to higher levels, and more generally, improve the student experience (Bridger, Shaw, and Moore 2012). Unfortunately, research on this remains highly limited despite the fact it is critical to HEIs, the UK government and, most importantly, to students themselves as changes in admissions may impact on their life chances and subsequent career opportunities (Jacobs 2008; Mullen 2011). Further research is necessary to ensure that university policies are based on firm evidence to safeguard fair access to HE.

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Appendix

Table A1. UoL widening access performance.

	1. LPN	2. Lower socio-economic groups (NS-SEC 4–7)	3. State schools/ colleges	4. Low-income households
UoL	8.5%	22.0%	87.6%	27.4%
English Russell Group	5.5%	18.3%	72.5%	21.4%
England	10.2%	30.9%	88.5%	31.6%

Note: 1–4 from the UoL 2014 Access Agreement.

Table A2. Description of outcome (educational performance) and predictor (contextual factors) variables.

Variables	Description
Outcome variables	
Average performance	Students' university academic performance was represented as a percentage indicating the average mark achieved for each year of their degree. Most analyses focused on final year performance as this has a 70% weighting on the overall degree
Final degree classification	Degrees were classified according to the UK undergraduate degree classification system; first class typically being awarded to those who achieved 70% and above, 2:1 to those who achieved between 60% and 69%, 2:2 awarded to those achieving 50% and 59%, and third-class degrees awarded to students achieving between 40% and 49%. For most analyses, a binary classification (1st and 2:1 versus others) was used
Predictor variables	
UCAS tariff points	UCAS tariff points are a system used for allocating points to post-16 qualifications in the UK (e.g. for A levels, A = 120, B = 100, C = 80, etc.). This was calculated from students' three highest qualifications and used as a measure of prior achievement for entry to HE
School type	The type of school students' attended for their A levels were organised into five categories including independent schools, state grammar schools, state comprehensives, sixth form colleges and the category labelled state other (includes voluntary aided schools, voluntary controlled schools, technical colleges and adults colleges)
School performance	School performance data were used to contextualise prior attainment, represented by the overall percentage of students gaining 5A*–E or more at A levels or equivalent. Based on this, a binary classification was created where 'high'-performing schools, represented those schools where 82.5% of students and above achieved 5A*–E or more at A level or their equivalent. 'Low'-performing schools were those where less than 82.5% of students achieved 5A*–E or more at A level or their equivalent based on averages reported in Department for Education performance tables

(*Continued*.)

Table A2. (*Continued*.)

Variables	Description
Neighbourhood participation	POLAR 3 data were matched to the CAS wards to illustrate the typical HE participation profile within which students were domiciled. POLAR 3 data were reported as five quintiles: ordered from '1' (lowest participation) to '5' (highest participation). A binary classification was created to compare performance of students residing in areas of lowest participation (1 and 2) to others (3, 4 and 5). Quintiles 1 and 2 are those areas, which attract additional widening participation funding for each student domiciled within them
Multiple deprivation	The IMD was used to identify the multiple facets of total deprivation. Students' postcodes were matched to LSOAs, which contain an average of 1500 households. These were then used to append IMD scores provided that students had a valid English postcode. There are 32,482 LSOAs in England. IMD ranks LSOA with 1 as most deprived and 32,482 as least deprived. For the analyses IMD scores were divided into quintiles, where quintile 1 includes the most deprived areas and quintile 5 includes the least deprived
Sex/ethnicity	Sex and ethnicity were self-reported by students during the university application process. Students' ethnicities were categorised as one of the following: white, Asian, black, Chinese, and mixed and other

Table A3. Descriptive breakdown of characteristics of study sample for students in all three-year degree programmes.

		Indicator of student performance									
		UCAS tariff points		Final year average		Degree – first class		Degree – class 2:1		Degree – class 2:2/3rd	
Variable	No.	*M*	SD	*M*	SD	No.	%	No.	%	No.	%
School type:											
Independent	564	359.40	74.92	61.59	6.48	53	9.40	345	61.17	166	29.43
Grammar	511	389.73	77.74	62.52	6.20	60	11.45	336	64.12	128	24.43
Comprehensive	2350	348.99	87.21	62.73	6.61	327	13.84	1506	63.73	530	22.43
Sixth form	1081	389.54	89.09	62.20	6.65	136	12.58	673	62.26	272	25.16
State (other)	55	335.64	82.07	61.79	6.53	4	7.27	34	61.82	17	30.91
		$p < .0005$		$p = .01$		$p = .01$		$p = .01$		$p = .01$	
School performance:											
High	3526	375.03	83.62	62.58	7.03	439	11.84	2394	64.58	874	23.58
Low	1822	333.26	96.61	62.36	6.44	136	15.61	520	59.70	215	24.68
		$p < .0005$		$p = .42$		$p < .01$		$p < .01$		$p < .01$	
Deprivation:[a]											
1	655	301.67	153.58	61.48	7.75	89	13.61	381	58.26	184	28.13
2	687	336.84	122.84	62.50	6.54	90	13.12	437	63.70	159	23.18
3	917	340.25	122.14	62.51	6.51	125	13.66	561	61.31	229	25.03
4	1153	350.81	113.98	62.83	6.21	150	13.01	753	65.31	250	21.68
5	1423	361.74	108.14	62.50	6.42	189	13.28	909	63.88	325	22.84
		$p < .0005$		$p < .01$		$p < .01$		$p < .01$		$p < .01$	

(*Continued*.)

Table A3. (*Continued*.)

		Indicator of student performance									
		UCAS tariff points		Final year average		Degree – first class		Degree – class 2:1		Degree – class 2:2/3rd	
Variable	No.	*M*	SD	*M*	SD	No.	%	No.	%	No.	%
POLAR 3:[b]											
High	4010	364.70	87.83	62.46	6.37	510	12.72	2539	63.33	960	23.95
Low	1222	356.78	92.31	62.13	7.22	175	14.37	739	60.67	304	24.96
		$p = 0.01$		$p = .02$		$p = .18$		$p = .18$		$p = .18$	
Sex:											
Males	1985	351.80	88.94	61.77	7.15	281	12.7	1290	58.1	649	29.23
Females	2949	370.10	88.73	62.93	6.11	423	13.4	2082	66.2	641	20.38
		$p < .0005$		$p < .0005$		$p < .0005$		$p < .0005$		$p < .0005$	
Ethnicity											
White	4913	297.38	40.32	62.63	6.14	644	13.11	3125	63.62	1143	23.27
Asian	127	299.00	45.94	60.03	6.55	12	9.60	61	48.80	52	41.60
Black	65	266.84	52.66	60.76	5.87	7	10.77	32	49.23	26	40.00
Chinese	48	280.00	44.49	62.60	9.07	12	25.00	25	52.08	11	22.92
Mixed	111	361.74	108.14	62.67	7.13	17	15.32	68	61.26	26	23.42
Other	105	293.22	45.43	63.21	6.53	12	11.43	61	58.10	32	30.48
		$p < .0005$		$p < .0005$		$p < .0005$		$p < .0005$		$p < .0005$	

[a]Defined by quintiles of IMD (1 = most deprived … 5 = least deprived).
[b]Neighbourhood HE participation.

Table A4. Unconditional bivariate logistic regression models for student characteristics with final degree performance (2:1 and 1st versus lower classification).

Indicator variable Variable	OR 'good degree'				
	No.	%	OR	95% CI	*p*-Value
State comprehensive (reference)	2334	51.5	1		
Sixth form college	1068	23.6	0.85	0.72–1.01	.07
State other	54	1.2	0.65	0.36–1.17	.15
State grammar	521	11.5	0.87	0.69–1.08	.21
Independent school	556	12.3	0.69	0.56–0.85	< .0005
School performance:					
High (reference)	3663	81.0	1		
Low	857	19.0	0.96	0.80–1.14	.62
Deprivation:[a]					
1 (reference)	642	13.5	1		
2	678	14.2	1.28	0.99–1.64	.06
3	907	19.0	1.134	0.90–1.43	.28
4	1145	24.0	1.37	1.09–1.71	.01
5	1401	29.4	1.33	1.07–1.65	.01
POLAR 3:[b]					
High (reference)	3964	76.8			
Low	1198	23.2	0.97	.83–1.13	.65

(*Continued*.)

Table A4. (*Continued*.)

Indicator variable Variable	OR 'good degree' No.	%	OR	95% CI	*p*-Value
Sex:					
Males (reference)	2179	41.1	1		
Females	3119	58.9	1.58	1.39–1.80	<.0005
Ethnicity					
White (reference)	4913	91.5	1		
Asian	127	2.4	0.43	0.30–0.62	<.0005
Black	65	2	0.45	0.27–0.75	<.01
Chinese	48	0.9	1.07	0.53–2.15	.86
Mixed	111	2.1	1.02	0.65–1.61	.93
Other	105	2	0.75	0.48–1.17	.20
UCAS points (continuous)	4952	92.2	1.01	1.01–1.01	<.0005

[a]Defined by quintiles of IMD (1 = most deprived … 5 = least deprived).
[b]Neighbourhood HE participation.

Table A5. Multiple logistic regression including all student characteristics (deprivation (IMD), school grades, school type, school performance, neighbourhood participation and sex) and final year performance (2:1 and 1st versus lower categories).

Indicator variable Variable	OR 'good degree (1st or 2:1)' No.	%	OR	95% CI	*p*-Value
State comprehensive (reference)	1829	49.0	1		
Sixth form college	968	26.0	0.67	0.55–0.82	<.0005
State other	35	0.9	0.58	0.27–1.24	.16
State grammar	416	11.6	0.71	0.54–0.94	.016
Independent school	482	12.9	0.61	0.48–0.77	<.0005
School performance:					
Low (reference)	644	17.3	1		
High	3086	82.7	0.78	0.62–0.98	.03
Deprivation:[a]					
1 (reference)	452	12.1	1		
2	520	13.9	1.25	0.92–1.70	.16
3	725	19.4	1.03	0.76–1.39	.85
4	918	24.6	1.34	0.99–1.82	.06
5	1115	30.0	1.17	0.87–1.59	.31
POLAR 3:[b]					
Low (reference)	820	22.0	1		
High	2910	78.0	1.08	0.86–1.34	.52
Sex:					
Males (reference)	1520	40.8	1		
Females	2210	59.3	1.52	1.30–1.79	<.0005
Ethnicity					
White (reference)	4913	91.5	1		
Asian	127	2.4	0.52	0.33–0.82	<.0005

(*Continued*.)

Table A5. (*Continued*.)

Indicator variable Variable	OR 'good degree (1st or 2:1)'				
	No.	%	OR	95% CI	*p*-Value
Black	65	2	0.47	0.24–0.89	.002
Chinese	48	0.9	1.33	0.52–3.38	.55
Mixed	111	2.1	1.33	0.73–2.40	.35
Other	105	2	0.84	0.47–1.53	.57
UCAS points (continuous)	4952	92.2	1.01	1.01–1.01	<.0005

[a]Defined by quintiles of IMD (1 = most deprived … 5 = least deprived).
[b]Neighbourhood HE participation.